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ABSTRACT

Parents' perceptions of their own past and present math achievement and their perceptions of the math abilities and attitudes of their daughters and sons were investigated. Reported here is one aspect of the study, focusing on the nature of sex-typing of parental attitudes toward math and the extent and consistency of such views. Data were obtained from parents by questionnaires on two occasions 1 year apart. Questionnaire items concerned (1) parents' own math attitudes, abilities, and performances; (2) parents' perceptions of their children's abilities and attitudes toward math; and (3) parents' general sex stereotyping of math abilities. Results indicated that parents strongly sex stereotype both their self-assessments of and subjective experiences with math as well as their daughters' or sons' math achievement. Mothers were more likely than fathers to hold a sex-differentiated view of their child's math achievement. In general, parents also strongly held math stereotypes for females and males, although these stereotypes were greater on issues of performance and utility than on aptitude. It was additionally found that (1) having a daughter may make a parent less likely to sex stereotype math; (2) parents who are positive or negative toward math are likely to hold such views about math for their child, particularly in the case of mothers and daughters; and (3) parents' general stereotypes about math do not relate to the sex differentiation of math for their children. (RH)

SEX DIFFERENCES IN CHILDREN'S MATH ACHIEVEMENT: PARENTAL ATTITUDES

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Some of our research over the last few years suggests that a child's self-assessment of and attitudes toward math may be more strongly related to their parents' perceptions of their abilities and attitudes than the child's own past performance. These findings are important because they indicate that parents may have a large impact on children's math achievement. Of particular concern to us is whether any sex differentiated preconception parents may have of their child's math abilities or attitudes is implicated in any sex differences in math achievement found among children. Since most parents see math as a male domain, these consequences may be particularly negative for daughters. Given this possible significance of parental attitudes, we investigated parents' perceptions of their own past and present math achievement and also their perceptions of the math ability and attitudes of their daughters and sons who were students in our sample. We were not only interested in documenting differences between mothers and fathers and differences between parents' perceptions of daughters and sons, but were particularly interested in investigating the relationship between parents' attitudes and child attitudes. In this paper I hope to describe the nature of the sex-typing of parental attitudes toward math, focusing on the extent and consistency of such views. The paper by Allan Wigfield will discuss the specific relationship between parental attitudes and children's attitudes.

We obtained data from parents by having them complete questionnaires. The data were collected primarily in two waves, a year apart. During the first year we sent to <u>each</u> parent of a child in our sample a questionnaire which included two sets of questions. One set asked about their <u>own</u> math attitudes, abilities and performance. For example, we asked parents how difficult and how important math was for them in the present and when they were attending high school, for their estimate of their own math ability, and for their perceptions of how useful their math education was for their jobs and everyday activities. This set of questions will be referred to as parent-self variables since they concerned parents' attitudes toward their own math achievement. A second set of questions assessed parents' perceptions of their child's abilities and attitudes toward math. For example, we asked parents for their perceptions of their child's math ability and for their estimates of the difficulty and importance of math for their child, as well as their perceptions of their <u>child's perceptions</u> of the importance of math. This set of questions will be referred to as parent-child variables since they were concerned with the parents' views about their child's math achievement. In addition to these two sets of questions, we also measured parents' general sex-stereotyping of math.

The first findings to be presented are results from an

analysis of the parent-self questions, then the general stereotype questions, and then the parent-child questions. For each set of items, differences between mothers and fathers and between parents of daughters and parents of sons will be discussed. Second, results from an analysis of the consistency of these parental attitudes, in which we examined the relationship between these three types of variables, will be presented. And finally, the possible impact of these findings on the relationship between parent and child attitudes toward math will be discussed.

But before presenting these results, the nature of sex differences in math performance scores for our students should be specified. This is important since any sex differences in parents' perceptions of their child's math achievement which are found may simply reflect the child's objective performance in math. To test this possibility, we obtained math record data on each student from achievement test scores and from class grades. Comparing female and male students on these variables revealed no significant differences on virtually all measures, although there was a strong consistent trend favoring females. A comparison of male and female students on a summary measure of math achievement, however, did result in significantly higher scores for females ($t=2.18, df=720, p<.05$). We can thus dismiss better math performance of sons over daughters as a factor influencing parental beliefs.

Turning to data comparing mothers and fathers on the parent-self items. Table 1 shows the mean difference on selected variables. Of the many individual items which were assessed, almost all were significantly different for mothers and fathers with fathers indicating a more positive attitude toward both past and present math. The table shows, for example, that fathers felt they were better at math, enjoyed it more and believed it a less difficult subject than mothers. These results are consistent with the stereotype of math as a male domain. They probably do not, however, reflect lower general academic ability or motivation on the part of mothers, since the mothers were more likely than fathers to recall having done well in high school overall and to have felt it was important to do well in high school.

These findings suggest that mothers, like their daughters, may in fact have performed as well as fathers in specific math courses despite being less positive about general past and present math achievement. If this is the case, mother's self-evaluations and attitudes are not consistent with such past performance criteria.

In addition to parents' self-assessments in math, we

TABLE 1

Mean differences (student t) between mother and father on selected parent-self variables

variable	Mean Fathers	Mothers	p
Math ability or aptitude described as good	5.4	4.6	.0001
Solving problems or doing tasks which involve math enjoyable	5.4	4.5	.0001
Past ability in math (scale)	49.6	43.0	.0001
Past effort required to do well in math (scale)	46.1	49.3	.001
Past difficulty with math courses (scale)	40.5	44.9	.0001
Present difficulty with math (scale)	27.3	35.4	.0001
Past importance of doing well in math courses (scale)	54.2	53.4	n.s.
Present usefulness of math skills (scale)	56.2	52.4	.0001
Usefulness of math courses for job (scale)	58.5	52.9	.0001
If given difficult math problem, prefer someone else to give answer	1.1	1.3	.0001
Did well in high school, in general	5.1	5.5	.0001
Was important to do well in high school	5.3	6.0	.0001

NOTE: Unless otherwise indicated, variables are individual questions asked of parents.

n.s. : t was non-significant.

measured their general sex-stereotyping of math by asking whether in math males or females 1) have more talent or ability, 2) actually do or perform better in advanced math classes and 3) find math more useful in their adult lives. Percent responses to these questions for mothers and fathers are shown in Table 2. While the majority of mothers and fathers said they believed males and females to have equal math ability, a large percentage also indicated that males both do better in math and have more use for math in their adult lives. Thus it seems that parents hold or admit to holding more sex-stereotypic beliefs regarding performance and utility in math than regarding actual ability differences. Why this difference exists is an intriguing question. Perhaps parents justify their sex-related beliefs about performance in and usefulness of math by recalling observable differences in the number of men in math classes or math related careers. Since actual ability is not observable, parents may be reluctant to express stereotypes regarding sex differences in actual ability level, especially given the amount of recent attention that has been focused on the issue of discrimination and prejudice.

It is interesting to note that fathers, compared to mothers, were particularly likely to believe that math was more useful for males than females. This may reflect the stereotypic view that women's careers or women's activities as wives and mothers do not require math skills.

When we examined these same general stereotype questions for parents of daughters versus parents of sons to see if the sex of their child might effect how they sex-stereotyped math, several interesting trends emerged. Parents of daughters were more likely to say males and females had equal math ability than parents of sons, although the difference was significant only for fathers ($t=2.33, df=513, p<.05$). Furthermore there was a non-significant trend indicating that mothers of daughters were more likely than mothers of sons to believe males and females performed equally well in math. Although we did not explore the effect of the sex of other children in the family, these results suggest that just having a daughter may make a parent less prone to stereotyping math as a male domain. In summary, the analysis of the parent-self and stereotype measures indicates that parents hold a strongly sex-differentiated view of math which favors males.

Let me now turn to our second set of questions, the parent-child measures. When we examined the parent-child questions by sex of the child, we found may differences between parents of daughters and parents of sons, all of which were in the expected direction. That is, parents of

sons indicated a more positive attitude and evaluation of their child's math achievement than did parents of daughters. Table 3 shows the mean difference on the most important of these variables. It shows, for example, that both parents of daughters rated math more difficult for their child and believed that trigonometry/calculus was less important for their child than did parents of sons.

Table 3 also indicates that in an academic area which is stereotypically female as well as overall school performance, the direction of the sex difference for daughters and sons is reversed. That is, parents of daughters were significantly more likely than parents of sons to believe English Literature was important for their child, and to believe their child was doing well in their academic subjects. These findings suggest that the negative view of math for daughters may be independent of a more general view of academic achievement.

The comparisons of parents of daughters and sons on the parent-child variables also showed that mothers differentiated more than fathers between daughters and sons. This may indicate that either they hold a more sex-stereotypic view of their child or that they are more perceptive or aware of their child's attitudes than fathers. This runs counter to the commonly held view that fathers sex-differentiate their children more than mothers.

In order to test for the consistency of parents' views of math achievement, we first examined the relationship between parent-self and parent-child attitudes. We felt that the more parents held positive views of math achievement for themselves, the more likely they might be to hold them for their child. Our data indicate some support for this view for both mothers and fathers, although the finding is stronger for mothers. In particular, mothers attitudes toward their daughters math achievement were strongly related to their view of their own math achievement. This relationship was stronger than any of the other parent-child pairs. This suggests that mothers may be projecting their self-image on to their daughters more so than onto their sons and more so than fathers. Given that mothers are more negative toward math than fathers, it would not be surprising if this attitude gets passed from mother to daughter.

As a further test of the consistency of parental attitudes, we examined the relationship between the general stereotype items and the parent-child variables. We hypothesized that if parents were consistent in their

TABLE 2

Percent distribution of mothers and fathers on general stereotype items

		Favoring Males	Females and Males equal	Favoring Females
Ability				
In general, how do you believe males and females compare in their mathematical aptitude or ability.	mothers	29%	69%	2%
	fathers	29%	68%	3%
Performance				
In general, who do you believe does better in advanced math courses.	mothers	42%	56%	2%
	fathers	42%	53%	5%
Useful				
In general, who do you believe finds math more useful for their adult lives.	mothers	47%	52%	1%
	fathers	68%	31%	1%

TABLE 3

Mean differences (student t) between parents of daughters and parents of sons on selected parent-child variables

variable	Mothers			Fathers		
	Daughters	Sons	p	Daughters	Sons	p
Perception of child's math ability (scale)	52.8	54.8	.05	51.4	52.1	n.s.
Perception of child's effort in math (scale)	43.2	40.0	.01	45.7	43.3	.05
Perception of child's difficulty in math (scale)	39.3	35.5	.01	41.3	39.0	.05
Importance of math for child (scale)	55.0	57.0	.01	54.8	56.1	n.s.
Perception of child's perception of importance of math (scale)	55.8	55.9	n.s.	53.4	53.1	n.s.
Future expectancy in math for child (scale)	55.1	56.3	n.s.	55.2	55.0	n.s.
Trigonometry/calculus important for child	4.8	5.4	.001	5.0	5.6	.0001
Geometry important for child	5.7	5.9	n.s.	5.5	5.7	n.s.
Chemistry important for child	5.3	5.6	.05	5.3	5.4	n.s.
Child enjoys math	5.3	5.5	.05	5.1	5.2	n.s.
Child thinks math learned in courses useful in future	5.4	5.7	.05	5.1	5.4	.05
Child doing as well as possible in math	5.5	5.2	n.s.	5.3	4.9	.05
Strongly encourage child to take math	5.2	5.7	.05	5.3	5.7	n.s.
Satisfied with child's math education	5.3	5.3	n.s.	5.0	5.2	.05
English literature important for child	5.8	5.5	.01	5.3	5.0	.05
Child feels important to do well in school	6.3	6.1	.01	6.2	4.6	.0001
Child doing well in academic subjects	6.1	5.7	.0001	6.1	5.6	.0001

NOTE: Unless otherwise indicated, variables are indiviual questions asked of parents about their daughters or sons.

n.s. : t was non-significant.

beliefs those parents who saw males and females as equal would be less likely to differentiate between their daughters and sons than parents who saw math as a male domain. However, we found little support for this view. This suggests that parents' general stereotype of females and males may not be not related to their sex-differentiated view of math for their child. It also suggests the possibility that the general sex-stereotype items may be highly susceptible to social desirability effects, which would mean that such measures may not accurately ascertain parental sex-stereotypes in math. It it is also likely that parents' views of math achievement toward their own children are simply based on a different set of criteria than their general attitudes.

In conclusion, our analysis of parent-self, parent-child and general stereotype questions revealed several interesting results. First, parents are strongly sex-typed regarding both their self-assessment of and subjective experience with math and their daughter's or son's math achievement. Mothers are more likely than fathers to hold a sex-differentiated view of their child's math achievement. Second, parents' stereotypes of math for females and males in general are also strongly held, although they are greater on issues of performance and utility than aptitude. Third, having a daughter may make a parent less likely to sex-stereotype math. Fourth, parents who are positive or negative toward math are likely to hold such views about math for their child, and this is particularly true of mothers of daughters. Finally, parent's general stereotypes of math do not relate to the sex-differentiation of math for their children. Overall, these findings show that the view of math as a male domain is alive and well in parental beliefs.

How might these findings effect the relationship between parent and child perceptions of math achievement? The answer probably depends on which set of parent variables are related to child attitudes, whether one or both parents attitudes are related and whether the effect is the same or different for daughters and sons. Given the prevalence and somewhat complex nature of parents' sex-differentiated beliefs of math achievement for themselves and their child, we would expect that the relationship between parent and child attitudes reflects such characteristics. Although each of the findings discussed in this paper may have an important impact on the relationship between parent and child attitudes, as individuals who would like to see less sex-stereotyping and greater participation of women in math, we are particularly concerned about the strong relationship between a mother's own negative attitudes toward math and her negative attitudes toward her daughter's math

achievement. It is unlikely that these attitudes do not impact in some manner her daughter. It is important, therefore, to compare parents' attitudes with their children's attitudes, self assessments and performance criteria in order to more fully understand the possible consequences of such parental views.